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Translocation of Rocky Mountain Elk to the Ingenika River, North-central British Columbia, 1996

M. D. Wood
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The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

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1.0 INTRODUCTION

Elk *(Cervus elaphus)* were numerous and widely distributed throughout British Columbia until a major population decline in the late 1800s (Spalding 1991). The causes of the decline are unclear although disease, severe winters, predation, and hunting have all been implicated as potential factors (Spalding 1991). Today, there are an estimated 6,200 Rocky Mountain elk *(C. e. nelsonii)* in northern British Columbia, most residing on the east slopes of the Rocky Mountains (Child 1988). In the Williston Reservoir watershed, the Finlay River drainage supports approximately 80-150 elk (Child 1988, Ritchie 1992) in several small relic herds in the Ingenika, Finlay, Akie, Pesika, and Ospika River drainages (Davidson and Dawson 1990). The north shore of the Williston Reservoir's Peace Arm is occupied by about 300 elk (Davidson and Dawson 1990), owing to a successful translocation of 145 elk in the mid-1980's (Harper 1988).

Elk populations in the Peace Sub-region[1] are thought to be rapidly expanding as a result of widespread habitat improvement (prescribed burning) and predator control programs (Harper 1988, Webster 1986 in: Spalding 1991). An increase in early seral habitats created by clearcut harvesting, and a series of mild winters, are thought to be responsible for the slowly expanding numbers of elk in the Omineca Sub-region[1] (Child and King 1988, Spalding 1991). Wildlife planning documents for the Omineca Sub-region state that the ability to increase elk populations in the region will depend on elk translocations, integrated planning with the Ministry of Forests, and habitat enhancement (Child and King 1988). British Columbia's Elk Management Plan also states that elk populations in the Omineca Sub-region are expanding only slowly, and that translocations may be required to stimulate population growth (Demarchi et al. 1992).

Wildlife translocations involve the intentional movement of animals from one place to another (Griffith et al. 1989, Smith and Clark 1994). Translocations have been conducted throughout North America in the past century to meet a variety of objectives including establishment of species in vacant habitat, re-establishment of species in formerly occupied ranges, augmentation of small existing populations, and less frequently, establishment of populations of non-native species (BC Environment 1986, Franzmann 1988, Griffith et al. 1989, Smith and Clark 1994). Elk translocations have a long history in BC and many have been successful at establishing or boosting herds (Demarchi et al. 1992, Ritchie 1992). The genetic strength of isolated herds can be compromised by in-breeding; relic herds can benefit from a new and vigorous gene pool contributed by translocated animals (Spalding 1991).

[1] Administrative area of the Ministry of Environment, Lands, and Parks

Since the turn of the century, the Ingenika River drainage at the north end of the Williston Reservoir has supported a small indigenous population of about 20-50 elk (Bonar 1975, Child and King 1988, Spalding 1991, Ritchie 1992). This small population is thought to have survived as an isolated group following the general decline of elk in the 1800s (Child 1988, Spalding 1991). The population was thought to be slowing expanding in the 1980's due to an increase in early seral habitats created by recent wildfires, and a series of mild winters (Child and King 1988). Although sufficient suitable habitat exists in the Ingenika River drainage to support a population of up to 200 elk (Child and King 1988), factors such as sustenance hunting, predation, and some harsh winters likely limit the small population's growth rate. Predation in particular can limit the expansion of a small group of animals, maintaining them in a static state. This situation is referred to as a 'predator pit': the low densities at which a population can not increase due to intense predation and negative population growth (Ballard and Van Ballenberghe 1998). The addition of new animals through translocation may create a core group of sufficient size to overcome a 'predator pit' situation (Spalding 1991).

In 1993, the PWFWCP began investigating the feasibility of translocating 50 to 60 Rocky Mountain elk into the Ingenika River drainage to augment the small existing herd of elk. The translocation was expected to provide an addition to the gene pool, increase the herd's reproductive potential, and boost the size of the core herd to aid in escaping a potential predator pit. The objective of the translocation was to establish a viable population of elk that could support a limited amount (5-8% per year) of harvest within 5-10 years. Child and King (1988) suggested that the Ingenika elk population could withstand harvest once the population reached 200 animals. The management policy for elk in the Omineca Sub-Region recommends a Limited Entry Hunting (LEH) system be implemented, with <10% harvest per year due to the species' low reproductive rate (Child and King 1988). Based on a conservative population growth rate of 10%, it was originally anticipated that an initial population of 70 elk (20 resident + 50 translocated) would increase to 100 animals in 4 years (when a population survey would be conducted), and 200 animals within 11 years. However, the population size after 4 years is estimated at closer to 65 animals based on the actual age/sex ratio of the translocated elk (see section 6.0).

This report documents the results of an elk translocation to the Ingenika River drainage in February 1996.

2.0 STUDY AREA

The Ingenika River flows into the north end of the Williston Reservoir in north-central British Columbia (Figure 1). The lower Ingenika River valley lies within the Cassiar Ranges ecosection of the Northern Mountains and Plateaus ecoregion of BC. (Demarchi 1995). Three biogeoclimatic zones exist in the area: the Boreal White and Black Spruce (BWBSdk1) zone in the valley bottom, the Engelmann Spruce Subalpine Fir (ESSFmv4) zone between 1,000 – 1,500 m, and Alpine Tundra (ATn) over 1,500 m (MacKinnon et al. 1990, Ministry of Forests 1995). The BWBSdk1 is a climatically dry subzone with an extensive fire history (MacKinnon et al. 1990, Meidinger and Pojar 1991). It has the least snowfall of all northern biogeoclimatic zones, and is important for wintering ungulates (Meidinger and Pojar 1991).

The translocation release site is situated at the base of the south-facing slopes on the north side of the Ingenika River (Figure 1). These slopes lie between 700-1,200 m elevation and, along with the adjacent Ingenika River valley bottom, provide the primary winter range for elk in the area. A large proportion of the surrounding area was subjected to a wildfire in 1970, and is now dominated by early seral stages of aspen (*Populus tremuloides*) and lodgepole pine (*Pinus contorta*), interspersed with older patches of pine, spruce (*Picea sp.*) and aspen in wetter sites and along the Ingenika River. Higher elevation summer range exists to the north and west.

A zone of low snow depths, relative to the remainder of the Williston Reservoir watershed, exists between the confluence of the Ingenika River and Pelly Creek eastwards along the lower Ingenika River valley, and north up the lower Finlay River valley to the Akie River (Davidson and Dawson 1990). Snow depths measured in the winters of 1990 and 1994 at various sites throughout the lower Ingenika River valley ranged between 50-61 cm (Martin 1994, Corbould in prep). The winters of 1990 and 1994 were at or slightly above long-term normals for the area (Corbould in prep).

The Ingenika River valley bottom is a major wintering area for moose (*Alces alces*), the most common ungulate in the area. Caribou (*Rangifer tarandus caribou*), Stone's sheep (*Ovis dalli stonei*), and mountain goats (*Oreamnos americanus*) frequent the higher elevations; elk and deer (*Odocoileus sp.*) are uncommon. Potential predators in the area include wolves (*Canis lupus*), grizzly bears (*Ursus arctos*), black bears (*Ursus americanus*), and wolverine (*Gulo gulo*) and coyote (*Canis latrans*).

Figure 1. Elk capture site at Groundbirch (⊙), and elk release site at Ingenika (🦌) in the Williston Reservoir watershed, north-central BC, for the Ingenika River 1996 elk translocation.

There are no land tenures in the Ingenika River valley; two grazing leases are held by the local guide-outfitter, but horses are not overwintered in the valley. A trapline with associated cabins, and a Finlay Forest Industries logging camp are situated in the immediate vicinity of the transplant. Forest harvesting activities have been minimal in the area to date; some harvesting has occurred south and east of the Swannell River. Much of the valley is in an early successional state owing to a 1970 wildfire that burned approximately 20,000 ha. The valley lies within Management Unit (MU) 7-40 which is currently closed to resident and non-resident hunting of elk although subsistence hunting by local Tsay Keh Dene is legal.

3.0 PRE-TRANSLOCATION PLANNING

Planning for the winter translocation of elk to Ingenika commenced in August 1993 with the investigation of various source herds of elk. The Kootenay Region in southeastern BC supports the highest densities of elk in the province, however, many are hosts to the giant liver fluke (*Fascioloides magna*). Although it is suspected that the flukes cannot survive in northern boreal environments, transplanting of elk from the Kootenays into northern BC has been halted (Demarchi et al. 1992). Recent analyses of elk livers from northern BC animals revealed only one liver infected with the fluke (from an animal that originated from the East Kootenays) (Blower 1990 in: Demarchi et al. 1992), thus source populations from the Peace Sub-Region in north-eastern BC were investigated.

Densities of elk are increasing in the Peace Sub-Region, and in some agricultural areas, depredation of domestic livestock forage by significant numbers of elk in winter is a problem. Therefore, the removal of elk from these areas would not only provide a source stock for translocation, but would also reduce local competition between elk and domestic livestock. In a review of wildlife translocations, Griffith et al. (1989) found that translocations were more successful if the source population was wild (versus captive-bred), at a medium to high density of animals, and increasing in numbers.

Our targeted number of elk desired for capture and translocation was 40-50 animals. Griffith et al. (1989) found an asymptotic relationship between the number of animals translocated and the success of the translocation; i.e. releasing more animals did not increase the success rate. They suggested that the asymptote is reached at releases of 20-40 animals for large native game species, thus we targeted the top end of this range.

Timing for the capture and translocation was scheduled for mid-winter since elk are more easily baited into traps in winter when competition for forage resources is high, and the elk could be released directly onto winter ranges occupied by resident elk that have knowledge of the local forage resources. Long-distance dispersal from the release site is also less likely in winter, when energy expenditures required for movement through snow are high.

A translocation proposal was drafted in September 1993, and referred for input to First Nations, guide-outfitters, trappers, government agencies, and forest licensees with a vested interest in the area (Wood 1993). Consultation with the Tsay Keh Dene resulted in an agreement from the band to support the translocation, and refrain from subsistence hunting until such time as the population could support harvest. The proposal was submitted to the Regional Manager of BC Environment's Omineca Sub-Region in November 1993. Final approval was obtained, and preparations for capture were initiated in January 1994.

Shortly after the translocation approval was received, reports of abnormally high snow conditions in the Ingenika area prompted an assessment of the current site conditions on 10 February 1994. Snow depths were found to be higher than normal; 8 resident elk were observed standing ankle to chest-deep in snow. No snow free slopes were available, and numerous craters dug by foraging elk were visible. Chest height is an important morphological characteristic affecting ungulate locomotion in snow (Telfer and Kelsall 1979), and snow depths exceeding 2/3 chest height have been found to severely restrict the movements of moose and white-tailed deer (*O. virginianus*) (Kelsall 1969). Sweeney and Sweeney (1984) found sites with >70 cm snow were rarely utilized by elk, and represented a serious physical limitation to elk movement. Schonewald-Cox et al. (1988) noted that if translocated animals have not yet learned the locations of critical food resources, deep snow can result in the death of the entire translocated population. Consequently, the translocation of elk in 1994 was canceled due to the deep snow conditions. A subsequent assessment of the area on 8 April 1994 found most south-facing slopes to be virtually snow-free.

Plans to attempt the translocation again in 1995 were postponed in October 1994 when Tsay Keh Dene withdrew the agreement to refrain from sustenance hunting. Negotiations with the band continued over the winter, and a letter of support was received in March 1995. Planning resumed, and a pre-translocation site assessment of the Ingenika area was conducted 14 January 1996. Eleven resident elk were observed, 6 of which were bedded on a snowfree slope. Snow depths appeared normal, and final capture preparations were initiated.

4.0 METHODS

4.1 Capture

Elk were captured in a 15 m diameter circular corral trap baited with hay and oats. The 3 m high, metal-framed sides of the trap were covered with netting and canvas; the canvas was rolled up to the top of the frame while the trap was set, thus providing a less confining setting. A 1.2 m wide gateway allowed for animal passage in and out of the trap. An increasingly narrow corridor leading off from the circular trap terminated at a wooden door on a pulley system. A cattle chute was positioned between the door and the transport trailer.

Elk moving into the trap were monitored with the use of night vision binoculars from a 10 m high tree-stand located about 30 m from the trap. Once a sufficient number of elk were observed in the trap (>15), a remote electronic release mechanism was triggered which closed the gate and released the rolled-up canvas walls, trapping the elk inside.

4.2 Handling

Elk were directed through the trap's corridor and into the cattle chute by walking around inside the trap with a plywood shield gently slowly the elk into the corridor. The door was closed once a single animal walked into the chute. The animal was blindfolded and a rope was placed around its neck to minimize movement. All elk were briefly examined for ticks and other obvious abnormalities. Antlers were removed from bull elk to reduce injuries to other elk during transport. Age, sex, behaviour, antibiotic dosages, and collar or tag number were recorded on capture forms (Appendix A). Photographs and video footage of the capture and handling process were also obtained.

A subcutaneous injection of up to 5 cc of ivermectin (Ivomec) was given behind the right shoulder. Ivermectin is used to treat for parasites including gastrointestinal parasites, blood-sucking external parasites, and other general worms. Elk were also injected intramuscularly in the rump with 4-6 cc of tetracycline (Lyquamycin). Tetracycline is a long-acting antibiotic (72 hrs) which acts to reduce the risk of pneumonia and other organisms that invade the respiratory tract. It is useful in situations where animals are under stress and in close quarters for a long period of time. However, the 15-25 cc dose (1cc/10kg bodyweight) required to effectively treat elk against pneumonia would have been difficult to administer and painful for the elk, and would likely cause additional unnecessary stress on the animal (Dr. H. Schwantje, BC Environment, personal communication). In other translocations situations, elk have been frequently

transported without significant pneumonia problems (Dr. H. Schwantje, BC Environment, personal communication). Thus a decision was made to inject the elk with a maximum of 6 cc of tetracycline as a biomarker only. A biomarker is a chemical injected into an animal that is incorporated into growing bones and teeth (Johnston et al. 1987). When sectioned and viewed under UV light, the cementum of the tooth will exhibit a fluorescent yellow mark.

All elk were marked for identification with radio-collars, nylon collars, or ear-tags. A sample of elk were selected for subsequent monitoring and fitted with Lotek LMRT-4 radio-collars with mortality sensors (Lotek Engineering, Newmarket, ON). Other elk were fitted with neckbands comprised of a cotton/canvas layer overlaid with a yellow or orange vinyl-coated nylon layer sporting large black numbers sewn into the nylon (Denver Tent Co., Denver, CO). These neckbands were 15 cm wide x 90 cm long with a series of grommets on one end of the neckband enabling adjustments down to 80 cm. The neckbands were secured around each animal's neck with industrial strength plastic tie wraps looped through the grommets. Some elk were marked with green Allflex ear-tags size #25.

4.3 Transport

Each elk was loaded individually into a 6 m gooseneck livestock trailer; hay was used to line the floor of the trailer. An adjustable partition in the mid-section of the trailer enabled separation of animals into two compartments. The trailer was hauled by a one-ton pickup truck. The 480 km travel route followed Highway 97 from Groundbirch west to Windy Point (just south of Mackenzie Junction), then turned north up the gravel Finlay, Chunamon, and Swannell Forest Service Roads to terminate on the north side of the bridge over the Ingenika River. Snow was shovelled into the livestock trailer during the trip to provide water for the elk. Each group of elk captured in the trap was processed and transported to the release site prior to the next trapping attempt; each capture and subsequent transport and release is referred to as a "session".

4.4 Post-Release Monitoring

Two radio-telemetry monitoring flights were conducted with a Cessna 182 fixed-wing aircraft within two weeks of the translocation. Habitat type, slope, aspect, and group size and composition were recorded for each radio-collared elk located. Position co-ordinates for each group were obtained using the on-board Global Positioning System (GPS) unit. Cover type and elevation were obtained by plotting locations on 1:50,000 NTS and BCFS Forest Cover maps.

5.0 RESULTS

5.1 Capture

On 10 January 1996, permit # C066935 was issued to the PWFWCP to capture up to 50 elk from MU's 7-20, 7-21, or 7-32 in the Peace Sub-Region. Preparations for capture began with the transport of the RMEF corral trap from Dawson Creek to Dunbar's Ranch in Groundbirch where repairs were completed, and the trap was erected and baited with hay and oats. Throughout December, 70-80 elk had been sighted frequently at Dunbar's Ranch, but sightings were only sporadic in January as the herd began to frequent nearby Tietjen's Ranch. Attempts to displace the elk away from Tietjen's and back to Dunbar's with a propane fired "Zon-gun" failed. Between 8 and 17 February, the trap was dismantled and re-erected at Tietjen's Ranch; baiting of the trap in its new location began on 11 February.

Fifty-eight (58) elk were captured at Tietjen's Ranch during 3 different trapping sessions over a 10-day period in late February 1996: Session 1: 20 elk (20 Feb, 0630 hrs); Session 2: 24 elk (22 Feb, 1930 hrs); and Session 3: 14 elk (27 Feb, ~0730 hrs) (Figure 1, Appendix B). Fifty (50) of the 58 elk were translocated including 30 adult females, 3 spike males, one 2-point male, and 16 calves (Table 1, Appendix B). The other 8 elk (bulls and calves) were released at the capture site. Weather conditions varied from sunny and warm (+5°C) on 20 February, to snowing and cool (-14°C) on 23 February, to sunny and very cold (-25°C) on 27 February.

Table 1. Age and sex composition[1] of elk captured at Groundbirch and translocated to the Ingenika River drainage in 1996.

Capture Date	Af	Am	Cf	Cm	TOTAL
20 Feb (Session 1)	8	3	2	6	19
22 Feb (Session 2)	12	1	5	0	18
27 Feb (Session 3)	10	0	1	2	13
TOTAL	30	4	8	8	50

[1] A = adult, C = calf, f = female, m = male

5.2 Handling

It took 4 hours to process the 20 elk captured during Session 1: 19 elk were loaded into the livestock hauler, and one mature 3 point bull was released at the capture site. During Session 2, nearly 5 hours was required to process the 24 elk trapped the previous evening. Six elk were released from the trap including 4 calves, a spike bull, and a 5 point bull. The 14 elk captured on Session 3 took only 3 hours to process; one elk was released.

All elk were processed individually in the cattle chute. Occasionally, 2 elk would bolt through the open gate into the chute; one was then forced back into the trap before processing began. Blindfolds were used during the second and third captures, and found to significantly calm the animals. Most elk (45 of 50) were injected with 6 cc of tetracycline; 3 adult females and a calf male were given 5 cc, and one female calf received 4 cc. Ivermectin injections ranged from 0-5 cc, with 42 of 50 animals receiving 3-5 cc. Some of the smaller calves were administered only 2-2.5 cc, and one female calf was not injected.

Ten adult females (7 from Session 1, and 3 from Session 2), were fitted with radio-collars for subsequent monitoring (Table 2, Appendix B). All remaining adult females, as well as 3 larger female calves and 2 spike bulls, were fitted with coloured neckbands (Table 2). All remaining calves and bulls were ear-tagged.

Table 2. Age and sex[1] of translocated elk marked with radio-collars, neckbands, and ear-tags.

MARKER USED	Af	Am	Cf	Cm	TOTAL
Radio-collar	10				10
Orange neckband	9	1	1		11
Yellow neckband	11	1	2		14
Green ear-tag		2	5	8	15
TOTAL	30	4	8	8	50

[1] A = adult, C = calf, f = female, m = male

All elk processed during Session 1 were loaded directly into the hauling trailer; no panels were used to separate the animals. During Session 2, calves were directed into a smaller second trailer following processing, while most of the adults were loaded directly into the hauling trailer. The partition in the mid-section of the hauler was closed prior to the transfer of the calves and some remaining adults into the back compartment of the hauling trailer. The partition was also used to

divide the trailer for the Session 3 translocation, but the 3 calves were mixed with the adult females.

5.3 Transport and Release

Each journey made between Groundbirch and the release site at the Ingenika River took 9.5 hrs. During Session 1, 19 elk were transported to Ingenika between 1700 hrs and 0230 hrs. Most elk departed quickly from the trailer, dispersing up the Grassy Bluffs road or up the steep aspen slopes to the north. Two elk went downhill and crossed to the south side of the river; their tracks were later observed crossing the airstrip and road near the Swannell logging camp. Ear-tagged calves #85 and #10 however, bedded down in the back compartment of the trailer, eventually departing by 0330 hrs. During Session 1, the total time elapsed between capture and release of the elk was 21 hours. Weather at the time of release was -2°C and snowing.

The Session 2 translocation of 18 elk to Ingenika took place between 1230 hrs and 2200 hrs. Unloading proved more difficult, as some elk refused to leave the trailer. Female calf (ear-tag #49) put up extreme resistance, kicking the inside walls of the trailer and smashing a flashlight, being held at the top windows of the trailer, with her hooves. Once coaxed out of the back door of the trailer, she re-entered through the side door. All elk had exited the trailer by 2330 hrs. Twenty-eight hours had elapsed between the capture and release of these animals.

The last load of 13 elk (Session 3) left Groundbirch at 1330 hrs arriving at Ingenika at 2300 hrs. The elk were unloaded and released without incident. In summary, all 50 elk captured during the 3 trapping sessions at Groundbirch were successfully released at Ingenika.

5.4 Post-Release Monitoring

Two fixed-wing flights were conducted within 2 weeks of the translocations to monitor the 10 radio-collared female elk. On 28 February, 6 radio-collared elk were located on the south-facing slopes above the Ingenika River, all within 3 km of the release site. The other 4 collared animals had moved into the valley on the south side of the river as far; the furthest was 5 km from the release site. An additional 14 elk (including three 5-point bulls) without radio-collars or neckbands were also sighted, however, some may have worn ear-tags not visible from the aircraft. On 7 March, 9 of the collared females were located within 2.5 km of their previous locations, while one was 5 km south at the Swannell River. Eight elk without radio-collars or neckbands were also seen.

5.5 Cost Summary

Costs for the translocation of 50 elk from Groundbirch to Ingenika in February 1996 amounted to $16,855 (Table 3). The two subsequent radio-tracking monitoring flights in February and March cost an additional $2,706.

Table 3. Total expenditures for the February 1996 translocation of 50 elk to Ingenika River (excluding biologist staff time).

TASK/ITEM	COST
Contractor (setting up corral trap; baiting & trapping elk)	8,931
Radio-collars (10)	3,217
Nylon neckbands (26)	675
Antibiotics and Miscellaneous Supplies	1,435
Corral trap transport (Dawson Cr-Groundbirch & return)	380
Elk transport (3 trips Groundbirch-Ingenika & return)	1,000
Travel & accommodations	1,217
TOTAL	**$16,855**

6.0 FUTURE MONITORING ACTIVITIES

Ten adult female elk were radio-collared to monitor dispersal from the release site, seasonal use of habitats, and adult female mortality rates, and to assist with obtaining a population estimate in 4 years (2000). Radio-telemetry was scheduled to be conducted 4-5 times/year on a seasonal basis: once each in spring, calving, summer, rut, and winter periods. Plans were revised in 1997 to decrease monitoring to once/year. Lotek LMRT-4 radio-collars have an estimated battery life of 4+ years enabling monitoring to be conducted until at least March 2000. A six year study of radio-collared caribou in the Omineca Mountains of the Williston Reservoir watershed found that where caribou outlived their collars, collar life ranged from 3.75 to 5+ years (two caribou with collars functioning for 5 years were still alive at the end of the study) (Wood 1998a).

In the winter of 99/00, prior to the expected expiration of the radio-collars, a population inventory following standard Resource Inventory Committee (RIC) aerial survey methodology will be conducted (RIC 1997). The stratified random block survey method, recommended for

estimating the absolute abundance of elk, will be employed (RIC 1997). Functioning radio-collars will be used to adjust survey results for sightability bias using the Lincoln-Petersen mark-resight estimator (RIC 1997, White and Garrott 1990). Based on a hypothetical initial resident late winter population of 20 elk (10 adult females, one 2 y.o. female, 2 female calves, 7 males), and due to the actual age/sex ratio of the 50 translocated animals (20 calves and adult males, only 30 adult females), the population is expected to remain stable at approximately 65 animals after 4 years. This estimate is based on the following assumptions: females produce first young at 3 y.o., birth rate 95%, sex ratio at birth 50:50, annual calf mortality 75%, annual yearling and adult female mortality 10%, and annual yearling and adult male mortality 30%.

7.0 RECOMMENDATIONS

7.1 Habitat Enhancement

Successful translocations rely on the maintenance of high quality habitat (Griffith et al. 1989, Schonewald-Cox et al. 1989). Prescribed burning of the south-facing slopes along the Ingenika River should be conducted to create and maintain early seral habitats, and thus maintain and/or enhance forage production for elk. Burning of the Ingenika slopes was scheduled by the PWFWCP in 3 consecutive years from 1996 to 1998, but was postponed due to a variety of factors including lack of approval from the Ministry of Forests, and unfavourable weather and site conditions. Any burns should be conducted with the maintenance of adjacent thermal and security cover in mind.

The PWFWCP has conducted prescribed burns to enhance forage production for moose and elk throughout the Finlay River drainage since 1990. The south-facing slopes at Pelly Lake, 20 km northwest of Ingenika, were burned in the spring of 1993 (Wood 1996). Elk were previously sighted in the Pelly Creek area, and it was anticipated that these burned slopes would encourage the expansion of elk into this area. Prescribed burns were also conducted in the Akie River and Pesika Creek (Wood 1998b) drainages 40 km northeast of Ingenika, in 1991 and 1993 respectively. Between 30 - 40 elk have been reported to overwinter in the Akie River and Pesika Creek drainages (Ritchie 1993). A low snowfall zone connects the Akie/Pesika area with the Ingenika drainage, and it is likely that these two groups of elk intermix.

7.2 Habitat and Population Protection

Forest development plans for the Ingenika River valley (from both the major licensee and small business sectors) have been submitted to the Ministry of Forests every year, however, various objections have deferred the approval of the proposed cutblocks to date (J. Tuck, BC Environment, personal communication). Subsequent to any future forest harvesting operations in the valley, high priority should be placed on pursuing access management. In harvested elk populations, increased road densities have been associated with increased vulnerability in elk, and subsequent increases in elk mortality (Leckenby et al. 1991, Zager and Leptich 1991, Unsworth et al. 1993). The long-term maintenance of thermal and security cover adjacent to clearcuts will also be critical. The need to support the protection of elk habitat in the Ingenika River valley was recently recognised by the Mackenzie Land and Resource Management Plan (LRMP) table. In September 1998, the LRMP table tentatively adopted the following wildlife management strategy for the Ingenika Resource Management Zone: "Identify important elk winter range, and manage seral stage distribution in these areas to provide long-term elk habitat" (J. Tuck, BC Environment, personal communication).

Winter snowmobile activity should be restricted if activity reaches levels causing stress and/or displacing elk from their primary winter range and critical food resources. A system for the legal harvesting of elk should not be implemented until the herd reaches a sustainable level of 150-200 animals. In the absence of radio-collared animals, subsequent stratified random block inventories may be required to monitor the population level.

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APPENDIX A: ELK CAPTURE FORM

1996 INGENIKA RIVER ELK TRANSPLANT - CAPTURE FORM

Page____

DATE	LOCATION	COLLAR FREQ	NYLON COLLAR #	EAR-TAG#	SEX	AGE	TETRA-CYCLINE	IVER-MECTIN	COMMENTS

APPENDIX B: ELK CAPTURE DATABASE

INGENIKA ELK TRANSLOCATION 1996 - CAPTURE RECORD

REC #	CAPTURE DATE	SEX	AGE	RADIO COLLAR	NYLON COLLAR	EAR-TAG	TETRA-CYCLINE	IVER-MECTIN	COMMENTS
1	Feb 20/96	F	A	861			6	5	Ear-tag ripped out, ear bleeding
2	Feb 20/96	F	A	872		76 green - R	6	5	Feisty, larger than 861
3	Feb 20/96	F	C		12 yellow		4	2	Very agitated, tremors
4	Feb 20/96	M	A		30 orange		6	4	Very agitated, spike bull, removed antlers
5	Feb 20/96	M	C			77 green - L	5	3	
6	Feb 20/96	M	C			78 green - R	6	4	Feisty, ripped tag out of left ear
7	Feb 20/96	F	A	832			6	5	Hair gone on left flank & right rib
8	Feb 20/96	M	C			79 green - R	6	4	Feisty, small amount of hair loss
9	Feb 20/96	M	A		11 yellow		6	5	Spike bull, removed antlers
10	Feb 20/96	M	C			80 green - R	6	3	Large skin patches showing on left & right flanks
11	Feb 20/96	F	A	842			6	5	Very agitated, hair loss on right flank, low body weight
12	Feb 20/96	F	A	851			6	5	Large body size, calm disposition
13	Feb 20/96	M	A			81 green - L	6	5	Good body condition, spike bull, antlers removed, tick on neck
14	Feb 20/96	F	A	823			6	4	Very quiet, fairly small body size
15	Feb 20/96	F	A	812			6	5	Very feisty, good body condition, some hair loss
16	Feb 20/96	F	A		23 orange		6	4	Good body cond'n, laid down in chute, needed help to stand, poss shock
17	Feb 20/96	M	C			85 green - R	6	3	Ear-tag ripped out of left ear, small hair patches missing left hip, tremors
18	Feb 20/96	M	C			10 green - R	6	3	Large patch of hair off right flank
19	Feb 20/96	F	C		13 yellow		6	2	Very small body, very agitated, small puncture on loin
20	Feb 23/96	F	A 2-3		15 yellow		5	3	Bleeding from mouth, & right inside flank
21	Feb 23/96	F	A	951			6	4	
22	Feb 23/96	M	yng A			47 green - L	6	4	2 pt bull, some ticks on back
23	Feb 23/96	F	C		21 orange		6	3	Big neck, bit calmer
24	Feb 23/96	F	A 2-3	801			5	4	Fairly calm, some hair loss
25	Feb 23/96	F	A		2 yellow		6	5	Calm, no hair loss
26	Feb 23/96	F	C			39 green - R	6	n/a	Some hair loss, fairly calm
27	Feb 23/96	F	C			48 green - R	6	2.5	Slight hair loss
28	Feb 23/96	F	C			43 green - L	6	2	Slight hair loss on left side, some blood from urine
29	Feb 23/96	F	C			49 green - R	6	2.5	Caught in trap w/ AdF, got trampled, some blood on back & hair loss
30	Feb 23/96	F	A	941			6	5	Backwards, difficult to get into trailer
31	Feb 23/96	F	A		4 yellow		6	4.5	Some blood on back from other elk?

REC #	CAPTURE DATE	SEX	AGE	RADIO COLLAR	NYLON COLLAR	EAR-TAG	TETRA-CYCLINE	IVER-MECTIN	COMMENTS
32	Feb 23/96	F	A		26 orange		6	5	Mature female
33	Feb 23/96	F	A 2-3		7 yellow		6	3	
34	Feb 23/96	F	A		3 yellow		6	4.5	
35	Feb 23/96	F	A		22 orange		6	5	Some hair loss
36	Feb 23/96	F	A 2-3		14 yellow		6	3	Some blood on back from other elk?
37	Feb 23/96	F	A		17 orange		6	3	
38	Feb 27/96	F	A		10 yellow		6	3	Adult female, some ticks
39	Feb 27/96	F	A		25 orange		6	3	
40	Feb 27/96	F	A		20 orange		6	3	Very stressed, hyperventilating
41	Feb 27/96	F	A 2-3		27 orange		6	3	
42	Feb 27/96	F	A		6 yellow		6	3	
43	Feb 27/96	F	A 2-3		5 yellow		6	3	
44	Feb 27/96	M	C			36 green - R	6	2	
45	Feb 27/96	F	A		1 yellow		5	3	Patches of hair loss on right side & left rump, put collar on second hole
46	Feb 27/96	F	A 3?		8 yellow		6	3	Smaller neck too, put collar on second hole
47	Feb 27/96	F	A		24 orange		6	3	Few ticks on back, scarring on inside right hock
48	Feb 27/96	F	C			23 green - R	6	2	Ear-tag hit vein, stressed, laid down
49	Feb 27/96	F	A		18 orange		6	3	
50	Feb 27/96	M	C			50 green - R	6	3	

ANIMALS RELEASED FROM CORRAL TRAP:

1	Feb 20/96	M	A	3 point bull
2	Feb 23/96	F	C	Fighter, bit of hair loss, very panicked
3	Feb 23/96	M	A	5 point bull
4	Feb 23/96	M	C	
5	Feb 23/96	M	A	yearling spike bull
6	Feb 23/96	M?	C	
7	Feb 23/96	M?	C	
8	Feb 27/96	?	?	